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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/003,151	11/02/2001	Denis Morrissey	50959	7421
7590		11/14/2003	EXAMINER	
S. Matthew Cairns		WONG, EDNA		
c/o EDWARDS & ANGELL, LLP		ART UNIT		
Dike, Bronstein, Roberts & Cushman, IP Group		PAPER NUMBER		
P.O. Box 9169		1753		
Boston, MA 02209		DATE MAILED: 11/14/2003		

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/003,151

Applicant(s)

MORRISSEY ET AL.

Examiner

Edna Wong

Art Unit

1753

-- **Th MAILING DATE** of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 October 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5, 7-14, 16-18, 23 and 24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5, 7-14, 16-18, 23 and 24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

This is in response to the Amendment dated October 14, 2003. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Response to Arguments

Claim Rejections - 35 USC § 112

Claims **1-18 and 23-24** have been rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The rejection of claims 1-18 and 23-24 under 35 U.S.C. 112, second paragraph, has been withdrawn in view of Applicants' amendment.

Double Patenting

I. Claims **1-18 and 23-24** have been provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims **10-27** of copending Application No. 09/976,421 (**Morrissey et al.**, Patent Application Publication No. US 2002/0043467 A1).

With respect to claims 6 and 15, the rejection under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 10-27 of copending Application No. 09/976,421 has been withdrawn in view of Applicants' amendment. Claims 6 and 15 have been cancelled.

With respect to claims 1-5, 7-14, 16-18 and 23-24, the rejection under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 10-27 of copending Application No. 09/976,421 is as applied in the Office Action dated July 9, 2003 and incorporated herein. The rejection has been maintained for the following reasons:

Applicants state that there is nothing in the claims of Application Serial No. 09/976,421 that suggests the use of two or more acids in a copper electroplating bath where at least one of the acids is a (C₃-C₆) alkylsulfonic acid. In response, Application Serial No. 09/976,421 is now pending allowance. Allowed claim 10, lines 4 and 6 (see attached "Listing of Claims"), recites an electrolyte comprising two or more acids wherein the acids comprise a mixture of inorganic and organic acid. Allowed claim 12 further recites that the organic acid is an alkylsulfonic acid. A generic disclosure (= an alkylsulfonic acid) renders a claimed species (= a (C₃-C₆) alkylsulfonic acid) *prima facie* obvious. *Ex parte George* 21 USPQ 2d 1057, 1060 (BPAI 1991); *In re Woodruff* 16 USPQ 2d 1934; *Merck & Co. v. Biocraft Lab. Inc.* 10 USPQ 2d 1843 (Fed. Cir. 1983); *In re Susi* 169 USPQ 423 (CCPA 1971).

Furthermore, issued claim 10 recites that the substrate is a semiconductor device comprising apertures having a size of less than or equal to one micron. A generic disclosure (= less than or equal to one micron) renders a claimed species (= diameters of 0.18 μ m or smaller) *prima facie* obvious. *Ex parte George* 21 USPQ 2d 1057, 1060 (BPAI 1991); *In re Woodruff* 16 USPQ 2d 1934; *Merck & Co. v. Biocraft Lab. Inc.* 10

USPQ 2d 1843 (Fed. Cir. 1983); *In re Susi* 169 USPQ 423 (CCPA 1971).

II. Claims **1-18 and 23-24** have been rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims **1-20** of U.S. Patent No. 6,531,046 B2 (**Morrissey et al.**).

With respect to claims 6 and 15, the rejection under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-20 of U.S. Patent No. 6,531,046 B2 has been withdrawn in view of Applicants' amendment. Claims 6 and 15 have been cancelled.

With respect to claims 1-5, 7-14, 16-18 and 23-24, the rejection under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-20 of U.S. Patent No. 6,531,046 B2 is as applied in the Office Action dated July 9, 2003 and incorporated herein. The rejection has been maintained for the following reasons:

Applicants state that there is nothing in the claims of the '046 patent that suggests the use of two or more acids in a copper electroplating bath where at least one of the acids is a (C₃-C₆) alkylsulfonic acid. In response, claim 1, line 6, of the '046 patent recites an acidic electrolyte bath comprising one or more acids. Claim 2 further recites that the one or more acids are selected from the group consisting of sulfuric acid, acetic acid, fluoroboric acid, nitric acid, alkanesulfonic acid, aryl sulfonic acid and sulfamic

acid. A generic disclosure (= an alkanesulfonic acid) renders a claimed species (= a (C₃-C₆) alkylsulfonic acid) prima facie obvious. *Ex parte George* 21 USPQ 2d 1057, 1060 (BPAI 1991); *In re Woodruff* 16 USPQ 2d 1934; *Merck & Co. v. Biocraft Lab. Inc.* 10 USPQ 2d 1843 (Fed. Cir. 1983); *In re Susi* 169 USPQ 423 (CCPA 1971).

Furthermore, claim 8 recites that the substrate has sub-micron features. A generic disclosure (= sub-micron features) renders a claimed species (= diameters of 0.18 μ m or smaller) prima facie obvious. *Ex parte George* 21 USPQ 2d 1057, 1060 (BPAI 1991); *In re Woodruff* 16 USPQ 2d 1934; *Merck & Co. v. Biocraft Lab. Inc.* 10 USPQ 2d 1843 (Fed. Cir. 1983); *In re Susi* 169 USPQ 423 (CCPA 1971).

Claim Rejections - 35 USC § 102

I. Claims **1-18 and 23-24** have been rejected under 35 U.S.C. 102(e) as being anticipated by **Mikkola et al.** (Patent Application Publication No. US 2002/0043468 A1).

The rejection of claims 1-18 and 23-24 under 35 U.S.C. 102(e) as being anticipated by Mikkola et al. has been withdrawn in view of Applicants' amendment.

II. Claims **1-18 and 23-24** have been rejected under 35 U.S.C. 102(e) as being anticipated by **Merricks et al.** (Patent Application Publication No. US 2002/0088713 A1).

With respect to claims 6 and 15, the rejection under 35 U.S.C. 102(e) as being anticipated by Merricks et al. has been withdrawn in view of Applicants amendment.

Claims 6 and 15 have been cancelled.

With respect to claims 1-5, 7-14, 16-18 and 23-24, the rejection under 35 U.S.C. 102(e) as being anticipated by Merricks et al. is as applied in the Office Action dated July 9, 2003 and incorporated herein. The rejection has been maintained for the following reasons:

Applicants state that while the range of alkylsulfonic acids disclosed by Merricks et al. overlaps Applicants' claimed range, there is no specific teaching in Merricks of a copper electroplating bath comprising an electrolyte comprising a mixture of acids wherein at least one acid is a (C₃-C₆) alkylsulfonic acid. In response, Merricks teaches a (C₁-C₁₀) alkylsulfonic acids (page 3, ¶ [0028]). (C₃-C₆) alkylsulfonic acids are included in this range and therefore are anticipated by the teaching. The disclosure of reference must be considered for what it fairly teaches one of ordinary skill in the art, pertinence of non-preferred disclosure must be reviewed in such light. *In re Meinhardt* 157 USPQ 270; and MPEP § 2123.

Furthermore, Merricks teaches substrates having 0.18 µm and smaller apertures (page 4, ¶ [0043]).

Claim Rejections - 35 USC § 103

Claims **1-18 and 23-24** have been rejected under 35 U.S.C. 103(a) as being unpatentable over **Dahms et al.** (US Patent No. 5,433,840).

The rejection of claims 1-18 and 23-24 under 35 U.S.C. 103(a) as being unpatentable over Dahms et al. has been withdrawn in view of Applicants' amendment.

Response to Amendment

Claim Rejections - 35 USC § 103

I. Claims **1-5, 7-14, 16-18 and 23-24** are rejected under 35 U.S.C. 103(a) as being obvious over **Mikkola et al.** (Patent Application Publication No. US 2002/0043468 A1).

The applied reference has a common assignee and inventor with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). For applications filed on or after November 29, 1999, this rejection might also be overcome by showing that the subject matter of the reference and the claimed invention were, at the time the invention was made, owned

by the same person or subject to an obligation of assignment to the same person. See MPEP § 706.02(I)(1) and § 706.02(I)(2).

Mikkola teaches a method of providing a metal seed layer substantially free of discontinuities disposed on a substrate comprising the steps of:

(i) contacting a metal seed layer having discontinuities disposed on a substrate (page 2, ¶ [0021]) with an electroplating bath comprising;

(a) a source of copper ions (page 3, ¶ [0027]);

(b) an electrolyte comprising two acids (page 3, ¶ [0029]); and

(c) optionally one or more additives (page 3, ¶ [0026]),

wherein the two acids are present in a ratio of 99:1 to 1:99 by weight (page 3, ¶ [0029]); and

(ii) electroplating copper on the metal seed layer (page 5, ¶ [0050]), wherein the substrate comprises apertures having diameters (page 6, ¶ [0055]), and wherein at least one acid is a (C₃-C₆) alkylsulfonic acid (page 3, ¶ [0028]).

The acids are selected from organic acids, inorganic acids, and mixtures thereof (page 3, ¶ [0029]).

The organic acids are chosen from alkylsulfonic acids, aryl sulfonic acids, carboxylic acids and halogenated acids (page 3, ¶ [0028]).

The inorganic acids are chosen from sulfuric acid, phosphoric acid, nitric acid, hydrogen halide acids, sulfamic acid and fluoroboric acid (page 3, ¶ [0028]).

The acids are present in a total amount of from about 1 to about 350 g/L (page 3, ¶ [0030]).

The source of copper ions is chosen from copper sulfates, copper acetates, copper fluoroborate, and cupric nitrates (page 3, ¶ [0027]).

The source of copper ions is present in an amount of from about 1 to about 300 g/L (page 3, ¶ [0027]).

The electrolyte further comprises a source of halide ions (page 3, ¶ [0032]).

The electroplating bath comprises three or more acids (= included in two or more acids) [page 3, ¶ [0029]].

Mikkola also teaches a method of manufacturing an semiconductor device (page 2, ¶ [0017]).

Mikkola does not teach wherein the apertures have diameters of 0.18 μm or smaller.

However, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because one skilled in the art would have been motivated to have modified the method of Mikkola with wherein the apertures have diameters of 0.18 μm or smaller because Mikkola teaches that the aspect ratios of at least 4:1 have diameters of about 200 nm or smaller (page 6, ¶

[0055]). A generic disclosure (= of about 200 nm or smaller) renders a claimed species (= of 0.18 μm or smaller) *prima facie* obvious. *Ex parte George* 21 USPQ 2d 1057, 1060 (BPAI 1991); *In re Woodruff* 16 USPQ 2d 1934; *Merck & Co. v. Biocraft Lab. Inc.* 10 USPQ 2d 1843 (Fed. Cir. 1983); *In re Susi* 169 USPQ 423 (CCPA 1971).

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

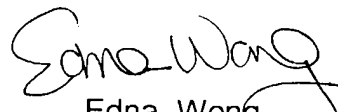
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edna Wong whose telephone number is (703) 308-3818. The examiner can normally be reached on Mon-Fri 7:30 am to 5:00 pm, alt.

Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (703) 308-3322. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9310.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1495.


Edna Wong
Primary Examiner
Art Unit 1753

EW
November 7, 2003